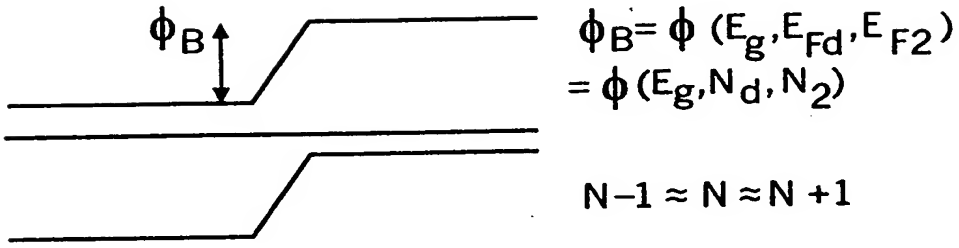
FIG. 1
Prior Art



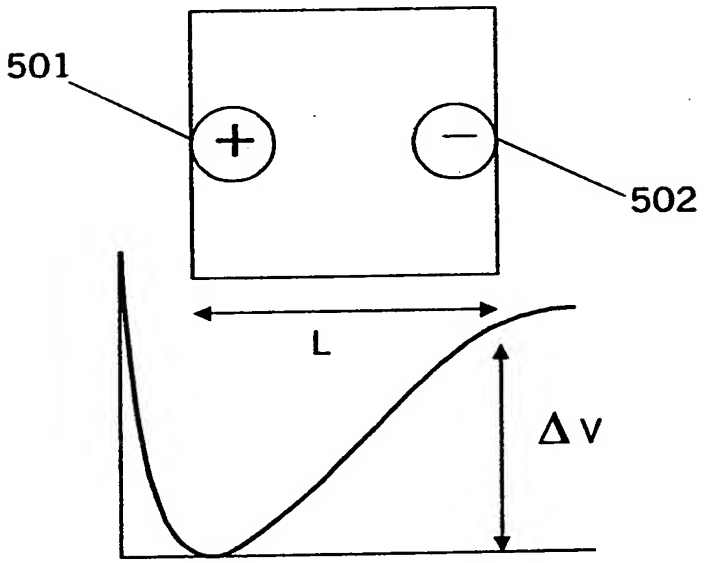


FIG. 5

FIG. 14

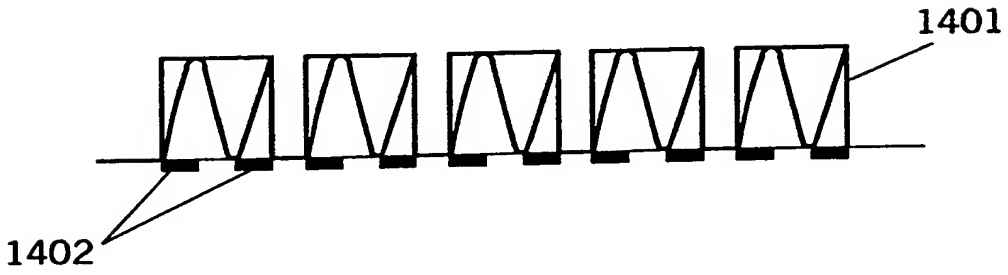


FIG. 2

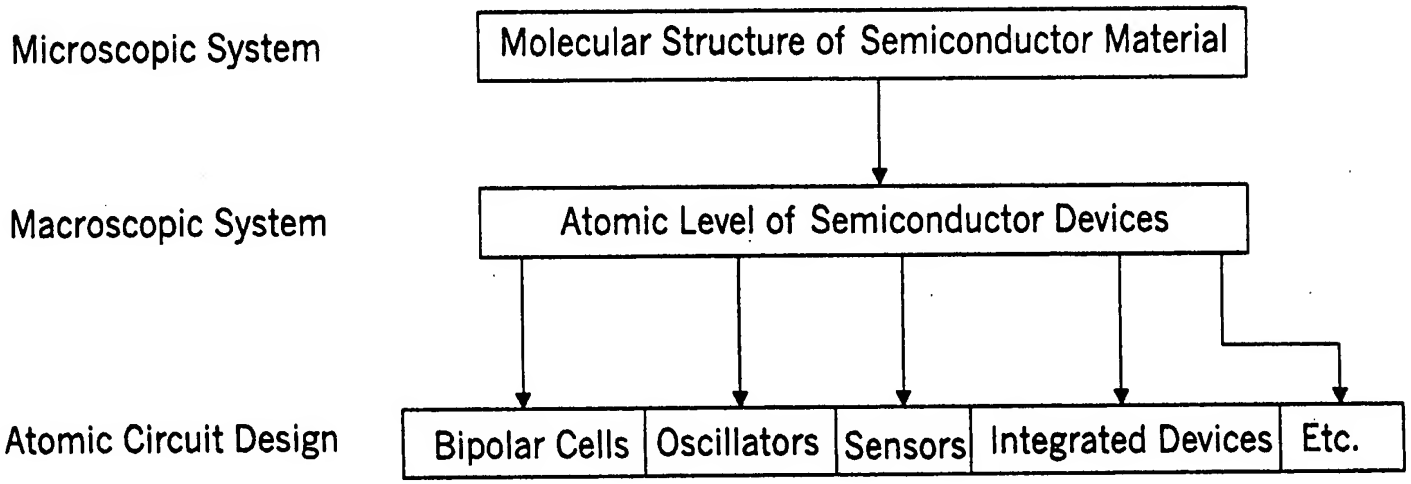


FIG. 3

L,nm	Number of Si atoms	Sigle-dopant concentration, cm^{-3}	Equivalent resistivity, $\Omega-cm$
100	50,000,000	1E+15	5.00
50	6,250,000	8E+15	2.00
10	50,000	1E+18	0.04
5	6,250	8E+18	0.01

FIG. 4

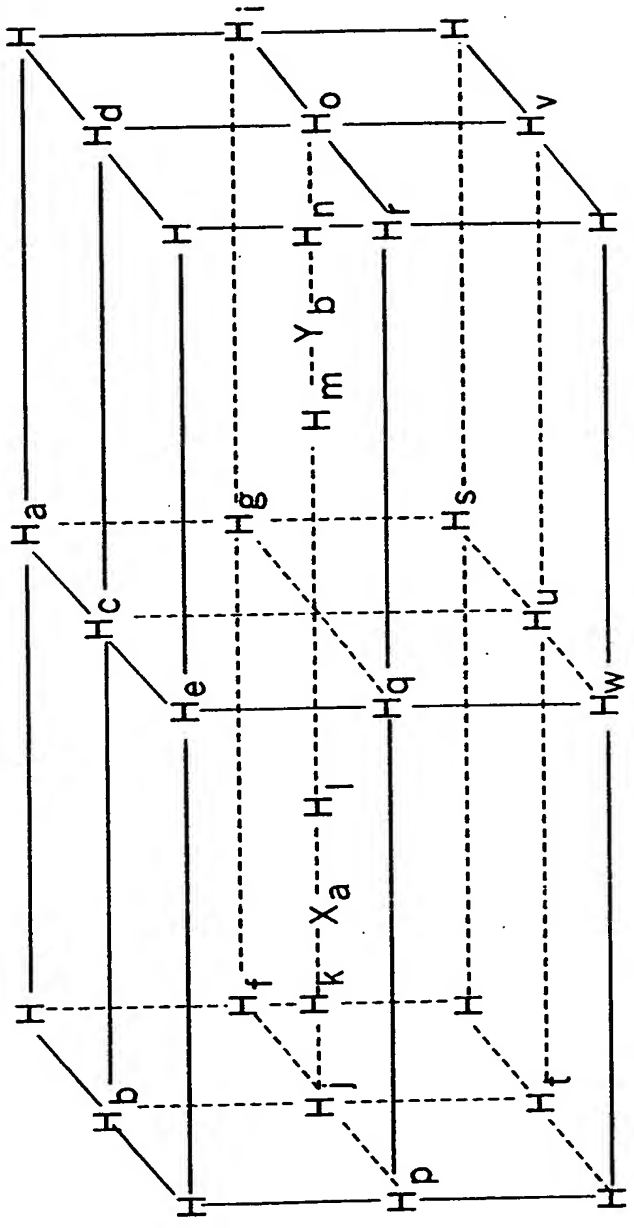

H
Hi
H
Hd
Ho
Hv
H
Hn
Hf
H
Ym
Yb
Ha
Hg
Hs
Hc
Hu
He
Hq
Hw
Xa
Xk
Hl
H
Hf
H
Hb
Hj
Ht
Hp
H
H

FIG. 6

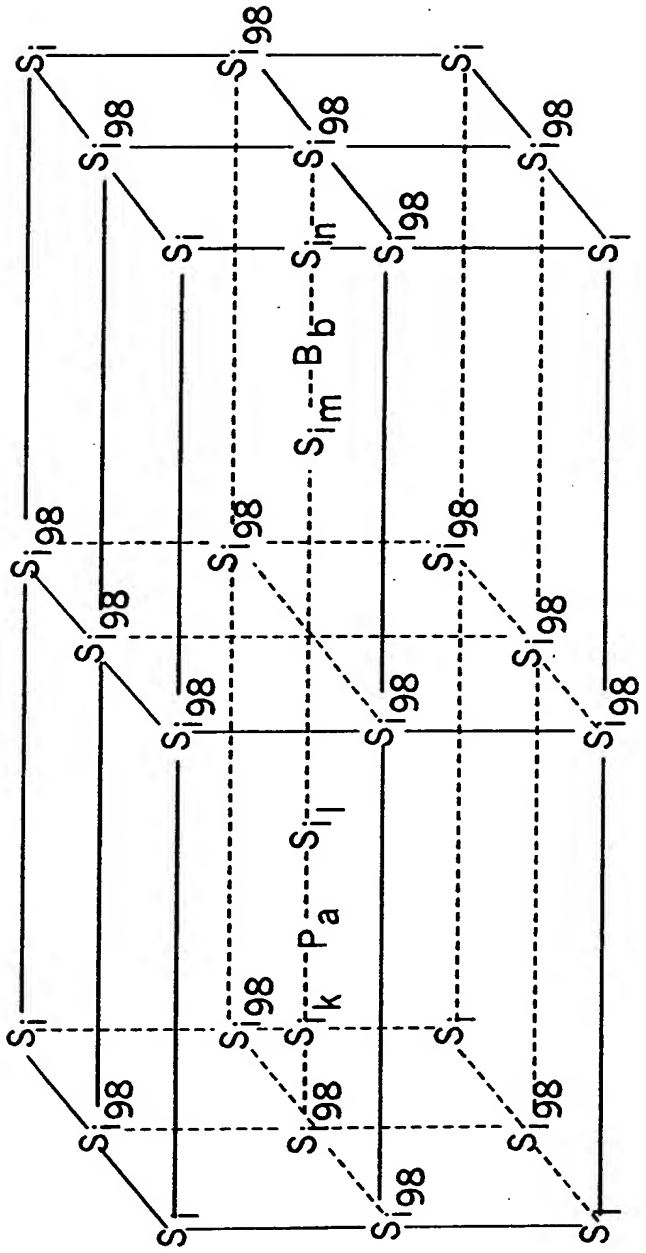


FIG. 7

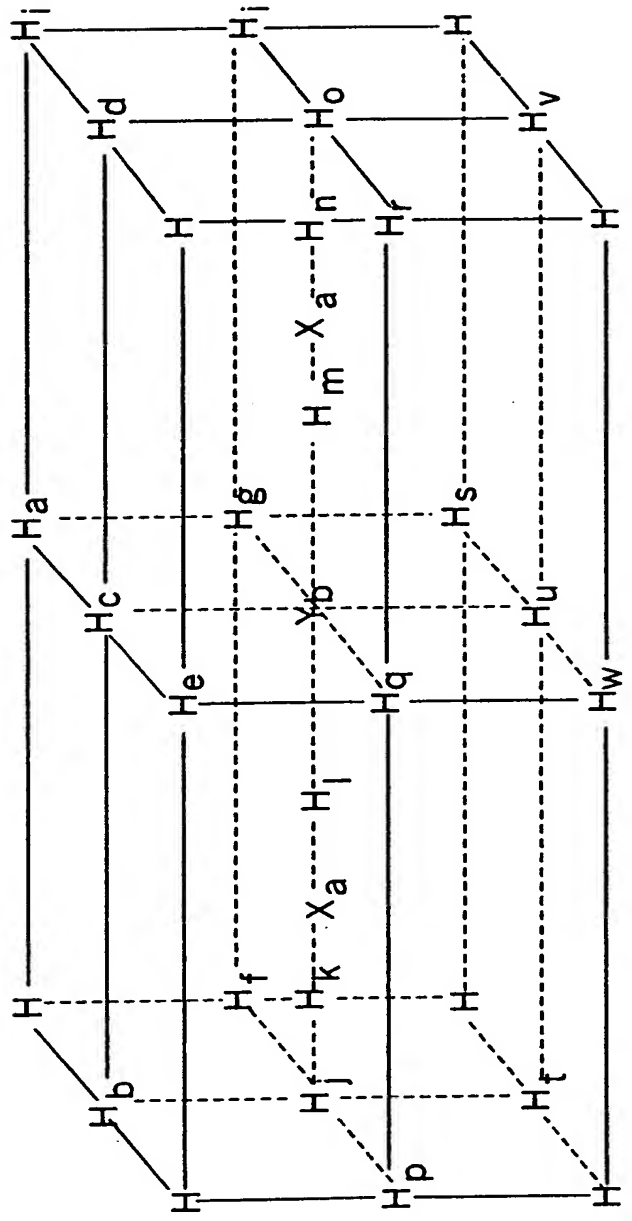

H
Hi
Hd
Ho
Hv
Hn
Hf
Hm
Xa
Ha
Hg
Hs
Hc
Xb
Hu
He
Hq
Hw
Hl
Xa
Hf
Hk
Hj
Hb
Ht
Hp

FIG. 8

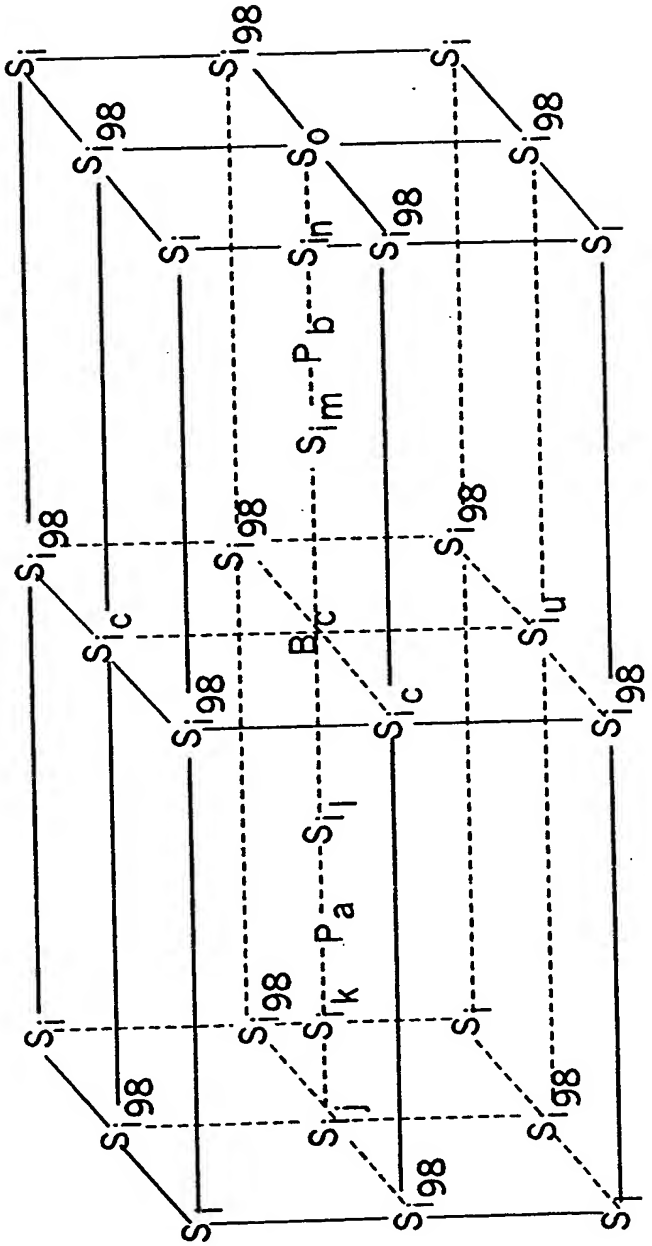


FIG. 9

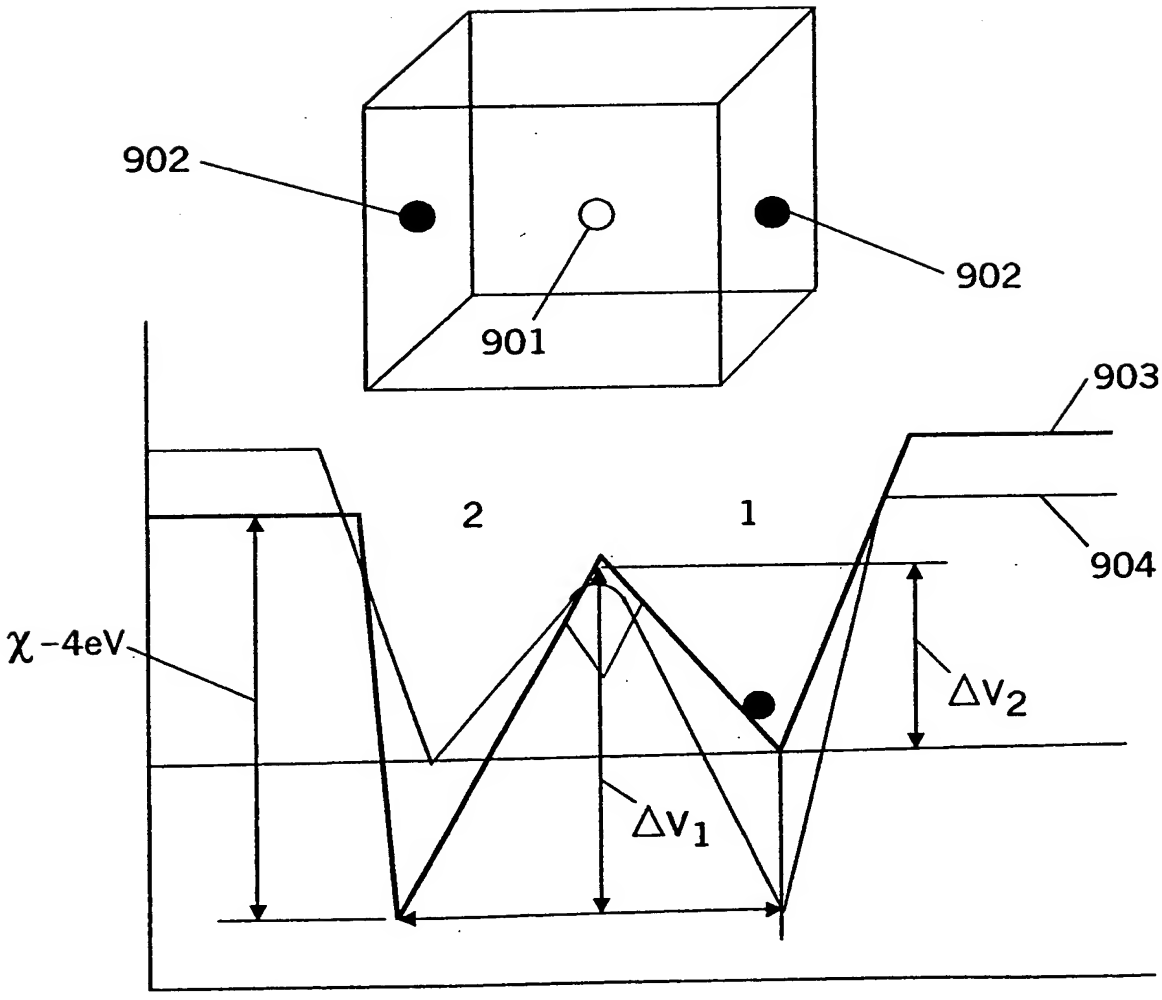


FIG. 10

$$\Delta V_1 = (e/\pi\varepsilon_0\varepsilon)L^{-1}$$

$$\Delta V_2 = (e/2\pi\varepsilon_0\varepsilon)L^{-1}$$

$$\Delta V_2 = \frac{1}{2}\Delta V_1$$

$$kT_{th} \sim \Delta V_2$$

$$T_{th} \sim \Delta V_2/k$$

– Thermal Threshold

L, nm	ΔV_1 Volts	ΔV_2 Volts	T_{th}, K
100	0.012	0.006	50
50	0.023	0.012	100
40	0.030	0.015	150
30	0.040	0.020	200
20	0.060	0.030	300
10	0.120	0.060	600
5	0.230	0.120	1200

FIG. 11

L, nm	ΔV_1 Volts	ΔV_2 Volts	T_{th}, K	τ, S	f, GHz	Power/cell, W	Power/cm^2, W/cm^2	Power/1D-array W/cm
100	0.012	0.006	50	3.14E-10	3.18	5.86E-12	0.0586	2.93E-07
50	0.023	0.012	100	1.11E-10	8.99	3.31E-11	1.33	3.31E-06
40	0.03	0.015	150	7.96E-11	12.6	5.79E-11	3.62	7.24E-06
30	0.04	0.020	200	5.17E-11	19.4	1.19E-10	13.2	1.98E-05
20	0.06	0.030	300	2.81E-11	35.6	3.28E-10	81.9	8.19E-05
10	0.12	0.060	600	9.94E-12	101	1.85E-09	1850.0	9.26E-04
5	0.23	0.120	1200	3.52E-12	284	1.05E-08	41900.0	1.05E-02

FIG. 12

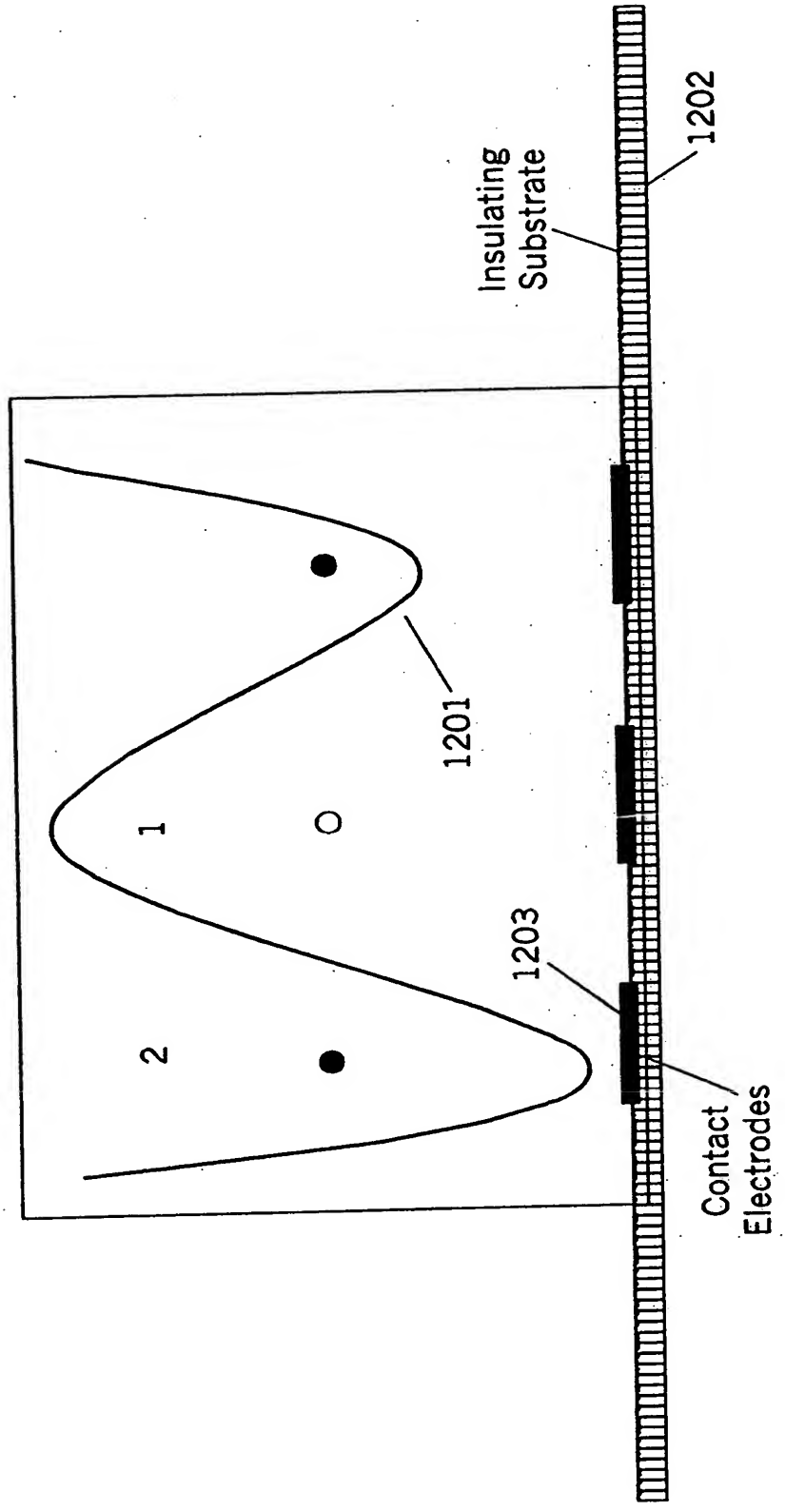

Insulating Substrate
1202
1201
1203
Contact Electrodes
0
1
2

FIG. 13

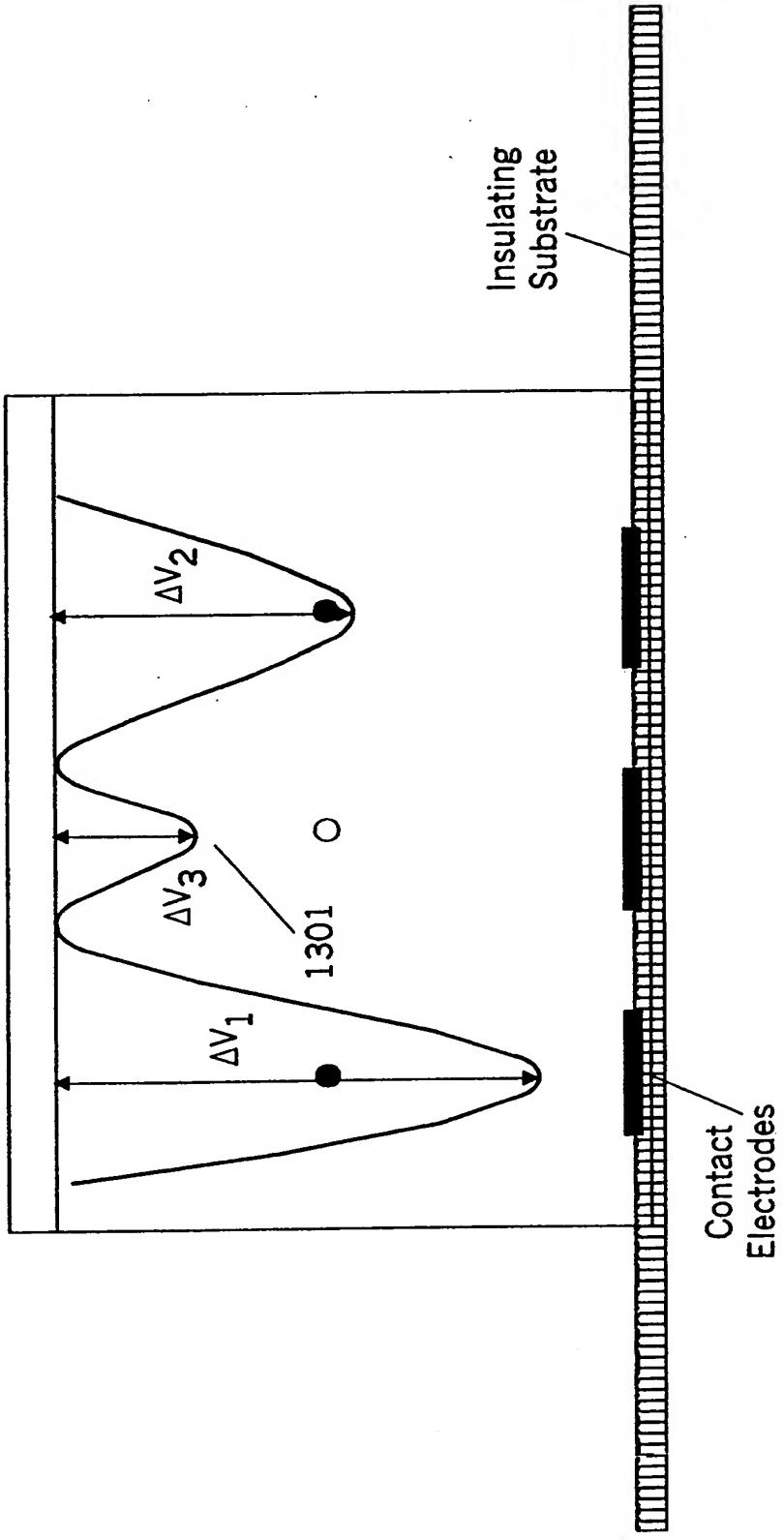

Insulating Substrate
ΔV_2
ΔV_3
1301
ΔV_1
Contact Electrodes

FIG. 15

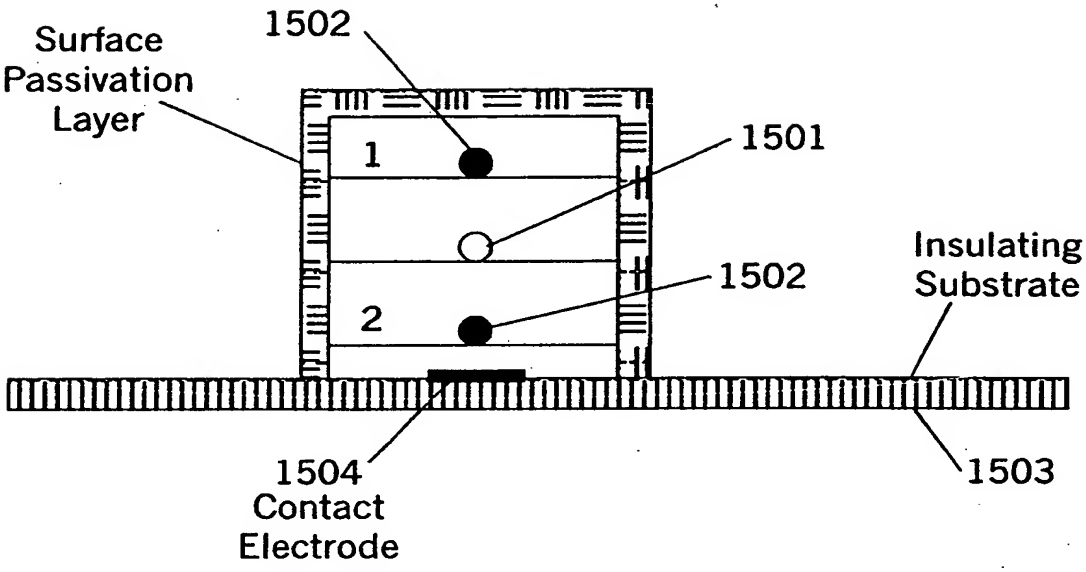

Surface
Passivation
Layer
1502
1501
1
2
1502
Insulating
Substrate
1504
Contact
Electrode
1503

FIG. 16

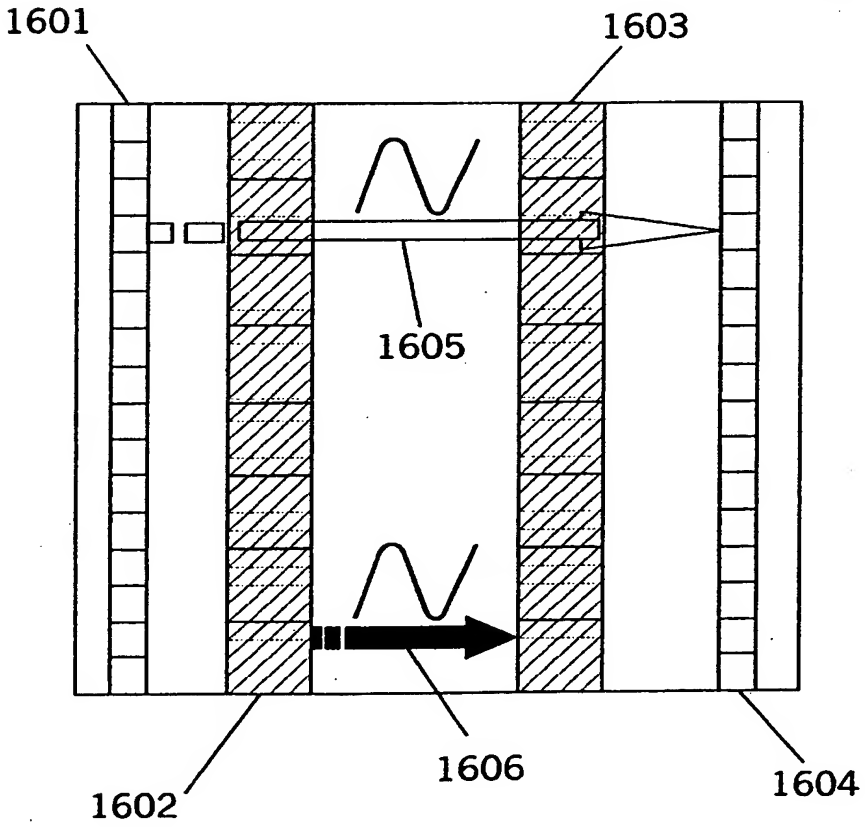

1601
1603
1605
1606
1602
1604

FIG. 17

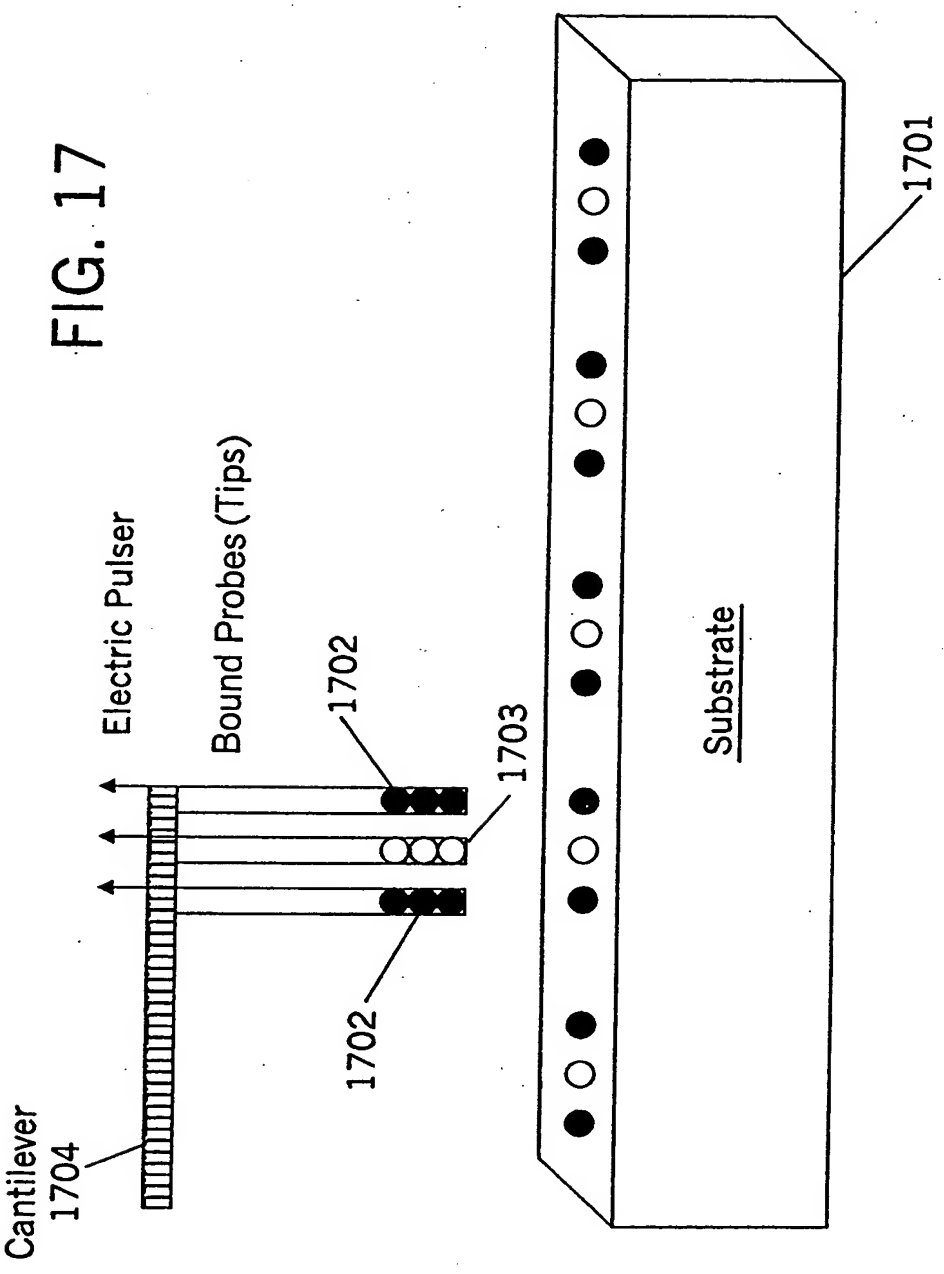

Electric Pulser
Bound Probes (Tips)
1702
1703
1702
Cantilever
1704
Substrate
1701

FIG. 18A

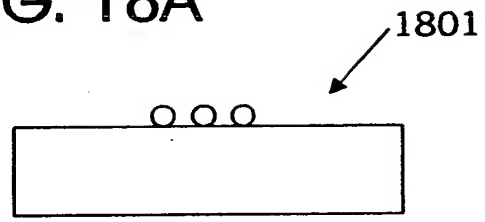


FIG. 18B

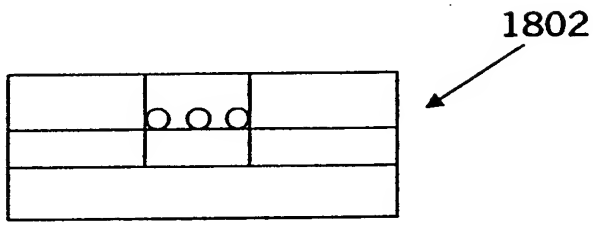


FIG. 18C

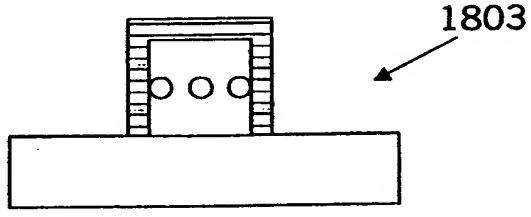


FIG. 19A

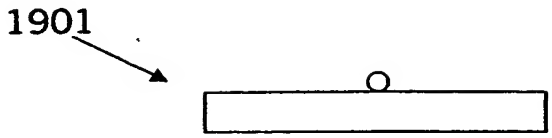


FIG. 19B

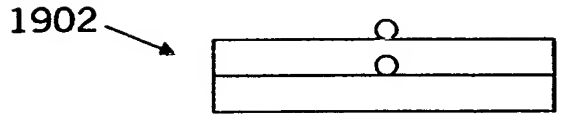


FIG. 19C

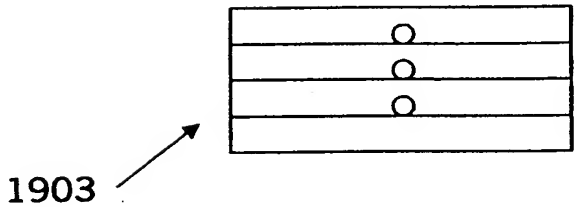


FIG. 19D